Number Properties and Operations
Students should enter high school with a strong background in rational numbers and numerical operations and expand this to real numbers. This becomes the foundation for algebra and working with algebraic symbols. They understand large and small numbers and their representations, powers and roots. They compare and contrast properties of numbers and number systems and develop strategies to estimate the results of operations on real numbers.
High School
Number Sense
MA-11-1.1.1a   *Students will use order relations (less than, greater than, equal to) to represent problems using real numbers.*
MA-11-1.1.1b   *Students will demonstrate the relationships between different subsets of the real number system.*
MA-11-1.1.1c   *Students will use scientific notation to express very large or very small quantities.*
Estimation
MA-11-1.2.1a   *Students will estimate solutions to problems with real numbers (including very large and very small quantities) in both real world and mathematical situations, and use the estimations to check for reasonable computational results.*

Number Operations
MA-11-1.3.1   **Students will solve real-world problems to specified accuracy levels by simplifying real number expressions involving addition, subtraction, multiplication, division, absolute value, integer exponents, roots (square, cube), and factorials.**   **DOK - 2**
MA-11-1.3.2   **Students will:**   • **describe and extend arithmetic and geometric sequences;**   • **determine a specific term of a sequence given an explicit formula;**   • **determine an explicit rule for the nth term of an arithmetic sequence; and**   • **apply sequences to solve real-world problems.**   **DOK - 3**   *MA-11-1.3.2a*   *Students will write an explicit rule for the nth term of a geometric sequence.*

Ratios and Proportional Reasoning
MA-11-1.4.1   **Students will apply ratios, percents, and proportional reasoning to solve real-world problems (e.g., those involving slope and rate, percent of increase and decrease) and will explain how slope determines a rate of change in linear functions representing real-world problems.**   **DOK - 2**

Properties of Numbers and Operations
MA-11-1.5.1   **Students will identify real number properties (e.g., commutative, associative, distributive, identity and inverse) when used to justify a given step in simplifying an expression or solving an equation.**   **DOK - 1**   *MA-11-1.5.1a*   *Students will use equivalence relations (reflexive, symmetric, transitive) to solve problems using real numbers.*

Measurement
Measurement Students continue to measure and estimate measurements including fractions and decimals. They use formulas to find surface area and volume. They use US Customary and metric units of measurement. They use the Pythagorean theorem and other right triangle relationships to solve real-world problems.
High School
Measuring Physical Attributes
MA-11-2.1.1 **Students will determine the surface area and volume of right rectangular prisms, pyramids, cylinders, cones, and spheres in real-world problems.** **DOK - 3**
MA-11-2.1.2 **Students will describe how a change in one or more dimensions of a geometric figure affects the perimeter, area, and volume of the figure.** **DOK - 3**
MA-11-2.1.3 **Students will apply definitions and properties of right triangle relationships (right triangle trigonometry and the Pythagorean theorem) to determine length and angle measures to solve real-world problems.** **DOK - 3**
Systems of Measurements
MA-11-2.2.1a *Students will continue to apply to both real world and mathematical situations U.S. customary and metric systems of measurement.*

Geometry
High school students expand analysis of two-dimensional shapes and three-dimensional shapes. They translate shapes in a coordinate plane. They extend work with congruent and similar figures, including proportionality.

High School

Shapes and Relationships
MA-11-3.1.1 **Students will analyze and apply spatial relationships (not using Cartesian coordinates) among points, lines, and planes (e.g., betweenness of points, midpoint, segment length, collinear, coplanar, parallel, perpendicular, skew).** **DOK - 2**
MA-11-3.1.2 **Students will analyze and apply angle relationships (e.g., linear pairs, vertical, complementary, supplementary, corresponding, and alternate interior angles) in real-world or mathematical situations.** **DOK - 2**
MA-11-3.1.3 **Students will classify and apply properties of two-dimensional geometric figures (e.g., number of sides, vertices, length of sides, sum of interior and exterior angle measures).** **DOK - 2**
MA-11-3.1.4 **Students will solve real-world problems by applying properties of triangles (e.g., Triangle Sum theorem and Isosceles Triangle theorems).** **DOK - 3**
MA-11-3.1.5 **Students will classify and apply properties of three-dimensional geometric figures (e.g., number of edges, faces, vertices).** **DOK - 2** *MA-11-3.1.5a* *Students will describe the intersection of a plane with a three-dimensional figure*
MA-11-3.1.6 **Students will apply the concepts of congruence and similarity to solve real-world problems.** **DOK - 3**

Transformations of Shapes
MA-11-3.2.1 **Students will describe properties of and apply geometric transformations within a plane to solve real-world problems.** **DOK - 3**

Coordinate Geometry
MA-11-3.3.1 **Students will apply algebra or graphing in the coordinate plane to analyze and solve problems (e.g., finding the final coordinates for a specified polygon, finding midpoints, finding the distance between two points, finding the slope of a segment).** **DOK - 2**

Data Analysis and Probability
School students extend data representations, interpretations and conclusions. They describe data distributions in multiple ways and connect data gathering issues with data interpretation issues. They relate curve of best fit with two-variable data and determine line of best fit for a given set of data. They distinguish between combinations and permutations and compare and contrast theoretical and experimental probability.

High School

Data Representations
MA-11-4.1.1 **Students will analyze and make inferences from a set of data with no more than two variables, and will analyze situations for the use and misuse of data representations.** **DOK - 3**
MA-11-4.1.2 **Students will construct data displays for data with no more than two variables.** **DOK - 2**
MA-11-4.1.3a *Students will represent real-world data using matrices and will use matrix addition, subtraction, multiplication (with matrices no larger than 2x2), and scalar multiplication to solve real-world problems.*

Characteristics of Data Sets
MA-11-4.2.1 **Students will describe and compare data distributions and make inferences from the data based on the shapes of graphs, measures of center (mean, median, mode) and measures of spread (range, standard deviation).** **DOK - 2**
MA-11-4.2.2 **Students will:** • **identify an appropriate curve of best fit (linear, quadratic, exponential) for a set of two-variable data;** • **determine a line of best fit equation for a set of linear two-variable data; and** • **apply line of best fit equations to make predictions within and beyond a given set of data.** **DOK - 3**

Experiments and Samples
MA-11-4.3.1 **Students will recognize inappropriate strategies for data gathering (e.g., non-random sampling, polling only a specific group of people, using limited or extremely small sample sizes, bias issues) and explain why these strategies can lead to inaccurate inferences.** **DOK - 2**

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Italics – Supporting Content Statement

Probability

MA-11-4.4.1
Students will:
   • **determine theoretical and experimental (from given data) probabilities;**
   • **make predictions and draw inferences from probabilities;**
   • **compare theoretical and experimental probabilities; and**
   • **determine probabilities involving replacement and non-replacement.**
DOK - 3
 	
MA-11-4.4.1a
Students will recognize or identify the differences between combinations and permutations and use them to count discrete quantities.
 	
MA-11-4.4.1b
Students will represent probabilities in multiple ways, such as fractions, decimals, percentages, and geometric area models.

Algebraic Thinking
High school students extend analysis and use of functions and focus on linear, quadratic, absolute value and exponential functions. They explore parametric changes on graphs of functions. They use rules and properties to simplify algebraic expressions. They combine simple rational expressions and combine simple polynomial expressions. They factor polynomial expressions and quadratics of the form $1x^2 + bx + c$.

High School

Patterns, Relations, and Functions
MA-11-5.1.1 **Students will identify and apply multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) to solve real-world or mathematical problems.** **DOK - 2** *MA-11-5.1.1a* *Students will identify, relate, and apply representations (graphs, equations, tables) of a piecewise function (such as long distance telephone rates) from mathematical or real world information.* *MA-11-5.1.1b* *Students will demonstrate how equations and graphs are models of the relationship between two real world quantities (e.g., the relationship between degrees Celsius and degrees Fahrenheit)*
MA-11-5.1.2 **Students will:**   **determine if a relation is a function;**   **determine the domain and range of a function (linear and quadratic);**   **determine the slope and intercepts of a linear function;**   **determine the maximum, minimum, and intercepts of quadratic function; and**   **evaluate a function written in function notation for a specified rational number.**   **DOK - 2** *MA-11-5.1.2a* *Students will find the domain and range for absolute value functions.* *MA-11-5.1.2b* *Students will apply and use direct and inverse variation to solve real world and mathematical problems.*
MA-11-5.1.3 **Students will identify the changes and explain how changes in parameters affect graphs of functions (linear, quadratic, absolute value, exponential) (e.g., compare $y=x^2$, $y=2x^2$, $y=(x-4)^2$, and $y=x^2+3$).** **DOK - 2**

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Italics – Supporting Content Statement

Variables, Expressions, and Operations
MA-11-5.2.1 **Students will apply order of operations, real number properties (identity, inverse, commutative, associative, distributive, closure), and rules of exponents (integer) to simplify algebraic expressions.** **DOK - 1**
MA-11-5.2.2 **Students will:**   **add, subtract, and multiply polynomial expressions;**   **will factor polynomial expressions using the greatest common monomial factor; and**   **will factor quadratic polynomials of the form ax^2+bx+c, when a=1 and b and c are integers.**   **DOK - 2** *MA-11-5.2.2a* *Students will factor quadratic polynomials, such as perfect square trinomials and quadratic polynomials of the form $ax^2 + bx + c$ when a≠1 and b and c are integers.*
MA-11-5.2.3 **Students will add, subtract, multiply, and divide simple rational expressions with monomial first-degree denominators and integer numerators (e.g., $\dfrac{3}{5x} + \dfrac{4}{3y}$; $\dfrac{9}{2a} - \dfrac{-7}{4b}$; $\dfrac{3}{-5x} \times \dfrac{-4}{7y}$; $\dfrac{5}{2c} \div \dfrac{9}{-11d}$), and will express the results in simplified form.** **DOK - 1**

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Equations and Inequalities
MA-11-5.3.1 **Students will model or solve first degree, single variable equations and inequalities, including absolute value, in real-world situations, and will graph the solutions on a number line.** **DOK - 2** *MA-11-5.3.1a* *Students will solve for a specified variable in a multivariable equation.*
MA-11-5.3.2 **Students will model or solve first degree, two-variable equations and inequalities in real-world problems, and will graph the solutions on a coordinate plane.** **DOK - 2**
MA-11-5.3.3 **Students will model and graph systems of linear equations (two equations in two variables) and apply the system to solve and interpret real-world problems.** **DOK - 3** *MA-11-5.3.3a* *Students will write, graph, and solve systems of linear inequalities (two inequalities in two variables) based on real world or mathematical situations and interpret the solution.*
MA-11-5.3.4 **Students will solve quadratic equations from real world or mathematical situations.** **DOK - 2**